

Coastal Zone Emergency Action Subplan: Pittwater Waterway

Hawkesbury-Nepean River System CMP

Northern Beaches Council and NPWS

5 December 2025



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GLOSSARY AND ABBREVIATIONS

Term	Definition
AIDR	The Australian Institute for Disaster Resilience
Beach erosion	Landward movement of the shoreline and/or a reduction in beach volume, usually associated with storm events or a series of events, which occurs within the beach fluctuation zone. Beach erosion occurs due to one or more process drivers: wind, waves, tides, currents, ocean water level, and downslope movement of material due to gravity.
BoM	Bureau of Meteorology
Council	Northern Beaches Council
CM Act	<i>The Coastal Management Act 2016</i>
Coastal cliff and slope instability	Geotechnical instabilities on coastal cliffs and bluffs, including rock falls, slumps, and landslides.
Coastal emergency	An emergency due to actual or imminent coastal inundation, coastal erosion, or coastal cliff and slope instability which (a) threatens endangers, or threatens to endanger, the safety or health of persons; or (b) destroys or damages, or threatens to destroy or damage, any property or the natural environment.
Coastal inundation	Coastal inundation occurs when a combination of marine and atmospheric processes raises the water level at the coast above normal elevations, causing land that is usually 'dry' to become inundated by sea water. Alternatively, the elevated water level may result in wave run-up and overtopping of natural or built shoreline structures (e.g., dunes, seawalls).
Coastal lake or watercourse entrance instability	Refers to the variety of potential hazards and risks associated with the dynamic nature of both natural and trained entrances. Coastal lake and watercourse entrances are highly active environments with their shape constantly changing in response to processes such as alongshore sediment transport, tidal flows, storms and catchment flooding.
Coastal protection works	The CM Act defines coastal protection works as: a) beach nourishment b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments, and groynes.
Combat Agency	The agency identified in this subplan as the agency primarily responsible for controlling the response to a particular emergency (SERM Act 1989).
CZEAS	Coastal Zone Emergency Action Subplan (this document)
DCCEEW	The NSW Department of Climate Change, Energy, the Environment and Water. Prior to 1 January 2024, the responsibilities of the department were carried out by the former NSW Department of Planning and Environment (DPE).
DPE	The former NSW Department of Planning and Environment. On 1 January 2024, the DPE was split into two new dedicated entities, the Department of Climate Change, Energy, the Environment and Water (DEECCW), and the Department of Planning, Housing and Infrastructure (DPHI).
ECL	East Coast Low
EMPLAN	Emergency Management Plan



Term	Definition
Essential infrastructure	Defined in the CM Act as infrastructure for the following purposes: electricity generation, transmission and distribution, telecommunications, rail, roads, gas, sewerage systems, water supply systems or stormwater management systems, airports, ports shipping and harbours.
Estuary	The CM Act defines an estuary as any part of a river, lake, lagoon, or coastal creek that is affected by coastal tides, up to the highest astronomical tide.
FRNSW	Fire and Rescue NSW
Hs	Significant Wave Height - the average of the highest one third of waves during a specific period.
LEMC	Local Emergency Management Committee. The LEMC is constituted under the SERM Act for each local government area and is responsible for preparing plans for response and recovery from emergencies.
LEMO	Local Emergency Management Officer
Local Emergency Operations Controller (LEOCON)	A Police Officer appointed by the District Emergency Operations Controller as the Local Emergency Operations Controller for the Local Government Area.
LGA	Local Government Area
MHWS	Mean High Water Springs. The long-term mean of the heights of 2 successive high waters during those periods of 24 hours (approximately once a fortnight) when the range of tide is greatest, during full and new moon.
NABE	Nature Assisted Beach Enhancement - sometimes referred to as beach scraping.
NSW SES	NSW State Emergency Service
Regional Emergency Operations Controller (REOCON)	The NSW Police Southern Region Commander is appointed as the REOCON. This role is typically responsible for coordinating emergency management efforts within a specific region of NSW during crises or disasters. performs the role of REOCON.
RFS	NSW Rural Fire Service
State Emergency Operations Controller (SEOCON)	This SEOCON role is a member of the New South Wales Police Force Senior Executive Service responsible for overseeing emergency response operations at the state level during major emergencies or disasters.
SERM Act	<i>State Emergency and Rescue Management Act 1989</i>
Tsunami	Defined in the State tsunami Plan as "A series of ocean waves with very long wavelengths (typically hundreds of kilometres) caused by large-scale disturbances of the ocean, such as earthquakes, landslide, volcanic eruptions, explosions, or meteorites".
Wave Run-up	The vertical distance above mean water level reached by the uprush of water from waves across a beach or up a structure.



1 INTRODUCTION

1.1 Background

This Coastal Zone Emergency Action Subplan (CZEAS) forms an integral part of the Hawkesbury-Nepean River System Coastal Management Program (HNRS CMP). It applies to the beaches and foreshores of the Pittwater waterway, within the Northern Beaches Council Local Government Area (LGA). These beaches are part of the legally defined study area for the HNRS CMP (Water Technology, 2025). It has been prepared based on the requirements of:

- *The Coastal Management Act 2016* (the CM Act).
- The NSW Coastal Management Manual (OEH, 2018a).
- The NSW Guideline for preparing a coastal zone emergency action subplan (DPIE, 2019).

1.2 Purpose and Objectives

As specified in the CM Act, a CZEAS is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to coastal emergency events immediately preceding or during periods of beach erosion, coastal inundation, or coastal cliff and slope instability, where those processes occur through storm activity or an extreme or irregular event.

Subsequently, this CZEAS details arrangements for the four phases of emergency events (prevention, preparation, response, and recovery) relating to coastal hazards for Pittwater.

In accordance with the New South Wales (NSW) Guideline for preparing a coastal zone emergency action subplan (DPIE, 2019), the purpose of this CZEAS is to identify and facilitate the implementation of appropriate emergency response actions in order to:

- Protect human life and public safety.
- Minimise damage to property and assets.
- Minimise impacts on social environmental and economic values.
- Not create additional hazards or risk.

The objectives of this CZEAS are to:

- Set a clear definition for what constitutes a coastal emergency (Section 2), and associated triggers for emergency response actions (Section 3).
- Identify the locations that may be affected by beach erosion, coastal inundation, or coastal cliff and slope instability that would constitute a coastal emergency (Section 4).
- Outline the roles and responsibilities of all public authorities, including Northern Beaches Council (Council) and the NSW National Parks and Wildlife Service (NPWS), and coordinate their response to emergencies immediately preceding or during periods of beach erosion, coastal inundation and coastal cliff and slope instability (Section 5).
- Outline the communications required in the four phases of emergency management (Section 6).
- Summarise key actions to be carried out in the four phases of emergency (Section 7).
- Identify approvals pathways for CZEAS actions as they relate to the NSW Coastal Management Framework (Section 8).



1.3 Consultation

Agencies other than Council involved in the implementation of this CZEAS, such as NPWS, the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), the NSW State Emergency Service (NSW SES), and approval agencies have been provided a copy of the draft CZEAS for review and comment. The final CZEAS has addressed all feedback received from key stakeholders.

1.4 Study Area

This CZEAS applies to public foreshore areas managed by Northern Beaches Council and NPWS. Six key foreshore locations have been identified as particularly vulnerable to beach erosion and/or coastal inundation due to exposure to ocean swell wave energy and the presence of significant public assets (see Figure 1-1):

- Station Beach (Council foreshore and NPWS foreshore)
- Snapperman Beach (Council foreshore)
- Sandy Beach (Council foreshore)
- The Basin Campground (NPWS land tenure)
- Currawong Beach (Council foreshore)
- Great Mackerel Beach (Council foreshore)

A detailed local emergency plan is provided for each of these areas (appendix A).

It is acknowledged, however, that other foreshore areas across Pittwater may also be exposed to coastal hazards. Accordingly, this CZEAS includes a “Pittwater-wide” plan applicable to all public foreshore areas within the waterway.

1.5 Overview of this CZEAS

A quick-reference overview of the contents of this CZEAS is provided in Figure 1-2, which contains references to the various sections of the CZEAS where more detail is provided. It is important to note that procedural flow chart is a non-linear continuum and contains feedback loops based on continuous monitoring and assessment throughout a given emergency event.



Figure 1-1 CZEAS and CMP Study Area

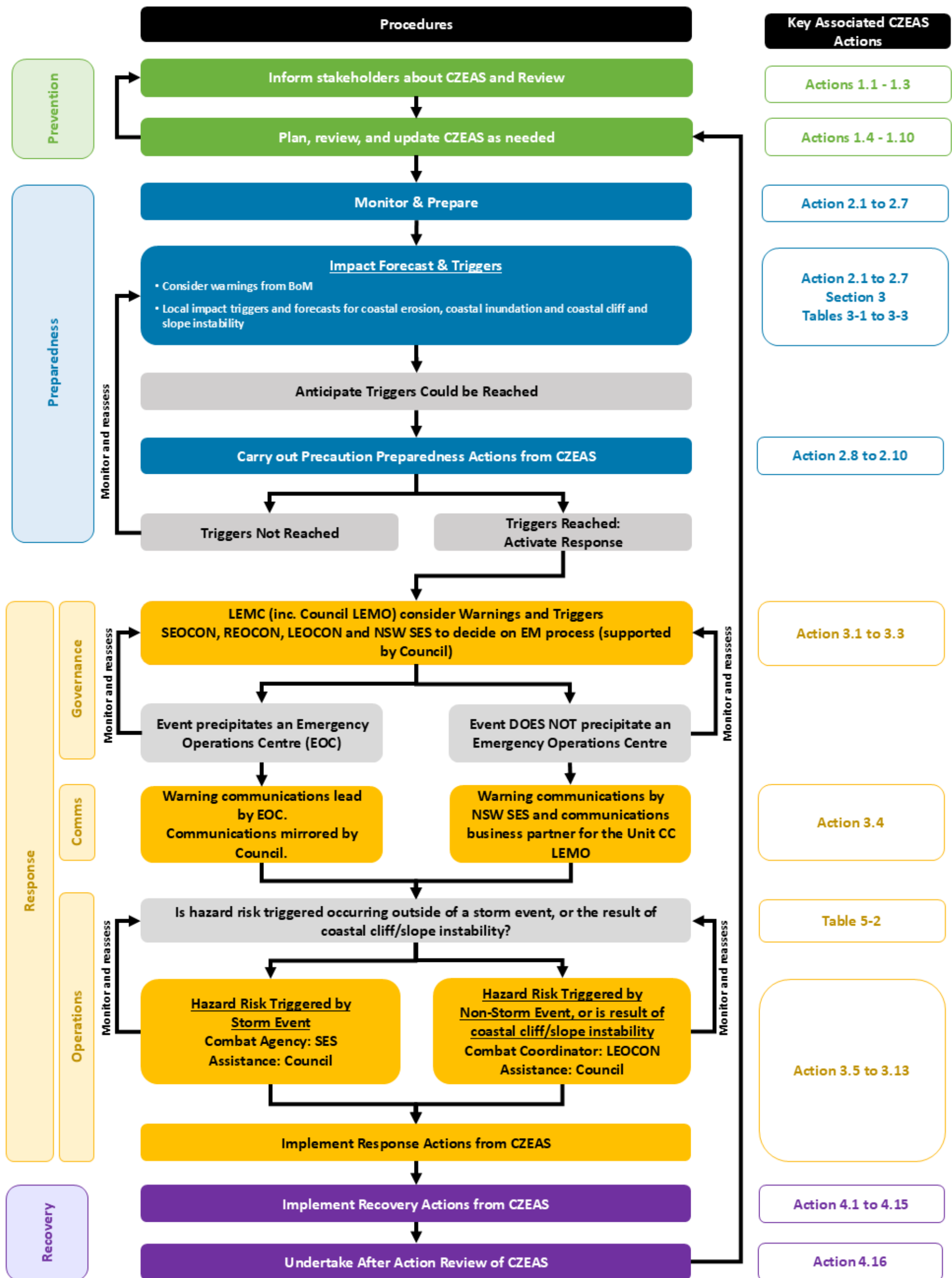


Figure 1-2 Quick reference overview of this CZEAS



2 SCOPE OF THE CZEAS

2.1 What is an Emergency?

2.1.1 Definition

An “emergency” is defined in the *State Emergency and Rescue Management Act 1989* (SERM Act) and the State Disaster Plan as:

“An emergency due to an actual or imminent occurrence (such as fire, flood, storm, earthquake, explosion, terrorist act, accident, epidemic or warlike action) which -

- a) endangers, or threatens to endanger, the safety or health of persons or animals in the State; or*
- b) destroys or damages, or threatens to destroy or damage, any property in the State, or*
- c) causes a failure of, or a significant disruption to, an essential service or infrastructure, being an emergency, which requires a significant and co-ordinated response.*

For the purposes of the definition of emergency, property in the State includes any part of the environment of the State. Accordingly, a reference in the Act to -

- a) threats or danger to property includes a reference to threats or danger to the environment, and*
- b) the protection of property includes a reference to the protection of the environment.”*

2.1.2 The Four Phases of an Emergency

Both the SERM Act and the NSW Coastal Management Manual (OEH, 2018a) identify four distinct stages of an emergency – prevention, preparedness, response, and recovery (see Figure 2-1).



Figure 2-1 Stages of Emergency Planning

2.2 Coastal Hazards

2.2.1 Definitions of Coastal Hazards

The NSW 2017 State Level Risk Assessment (NSW Office of Emergency Management, 2017) classifies storm and coastal erosion as priority hazards that pose a significant risk to the state. The CM Act identifies three types of coastal hazards that should be considered when developing a CZEAS. These are defined in the guidelines (DPIE, 2019) as:



- **Beach erosion:** Not all beach erosion occurring during a storm event provokes a coastal emergency response. Therefore, a “beach erosion emergency” in the context of this CZEAS can be defined as an actual or imminent occurrence of a beach erosion event that occurs when wind, waves, and currents are removing the sediment that comprises the foreshore and/or frontal dune system, landward of the fully accreted condition. The consequence of such erosion can create risks to public safety, and public and private assets - which requires a coordinated emergency response.
- **Coastal inundation:** Coastal inundation occurs when marine and atmospheric forces combine and raise water levels at the coast (or inside estuaries) above normal elevations causing dry land to be inundated by seawater. Coastal inundation is often associated with storms and results in elevated still water levels (storm surge), wave set-up, wave runup and over-wash flows. Storm surges and powerful waves can also penetrate estuaries giving rise to strong currents or seicheing. This may result in the inundation of roads and low-lying land adjacent to estuaries. For the open coast, it is associated with wave overtopping of beach dunes and the extent of wave runup onto the back-beach area.
- **Coastal cliff and slope instability:** This refers to a variety of geotechnical processes on coastal cliffs and bluffs, including rock fall, slumps, and landslides. These may be driven by coastal processes such as wave undercutting and overtopping, or by differential weathering of rock layers in cliffs and bluffs or by surface and groundwater flows generated by extreme rainfall. Instability may occur during or following a coastal storm event but may also occur at other times. There may be very little warning that a coastal cliff or slope instability incident is imminent. These hazards may endanger life and property at the site of the process (e.g., through collapse of a lookout platform or walking track, or undermining of dwellings), and at the toe of the cliff or bluff (rock platform or beach).

As stipulated in the *NSW Guideline for preparing a coastal zone emergency action subplan* (DPIE, 2019), the other coastal hazards identified in the CM Act are outside the scope of this CZEAS – including long term shoreline recession, coastal lake or watercourse entrance instability, tidal inundation, and erosion and inundation of estuary foreshores caused by tidal waters and the action of waves. These hazards either pertain to estuary environments outside the scope of this CMP or are not related to storm activity or an extreme or irregular event.

As outlined in Section 2.4, this CZEAS does not relate to other forms of inundation including flooding from land or tsunamis.

2.2.2 Recognising the Complexity of Coastal Hazard Events

Storm Clustering

From a coastal hazard perspective, it is important to note the impacts of storm clustering. An erosion storm cluster occurs when a beach is unable to adequately recover from a previous storm event before a subsequent one commences. The response of a beach to a storm and a storm cluster will depend largely on the physical characteristics of that particular beach, including sediment type, shoreline orientation and wave climate (Geoscience Australia, 2021).

In this way, a cluster of less severe storm events can generate a greater erosion response than an individual, high severity event (Gravois, Baldock, Callaghan, Daivies, & Nichol, 2018).

The implication for the CZEAS are:

- Even moderate swell events may cause significant levels of damage if they occur after a large event.
- Emergency teams must re-evaluate site conditions after each event to update risk profiles.
- Recovery and readiness plans must anticipate follow-up storms before full repairs or natural recovery occur.



- Previously stable areas (e.g., access points, cliffs, dunes) may become dangerous after cumulative impacts.

Cascading and Compounding Emergencies

The Pittwater coastline is impacted by East Coast Lows (ECLs), and this phenomenon is one of the most significant contributing factors to the occurrence and intensity of coastal hazard emergencies along the NSW coast (AdaptNSW, 2023). ECLs are intense low-pressure systems that occur off the east coast of Australia. They bring damaging winds and surf, as well as heavy rainfall, which leads to erosion and flooding.

Consequently, coastal hazards emergencies do not always occur at a localised scale, nor with a single discrete hazard type. When facing events like an ECL, the consequences can be multifaceted. Coastal erosion and inundation may be occurring at numerous beaches concurrently, while the same event may also generate rainfall that leads to riverine or estuarine flooding, and potential coastal cliff and slope instability.

In this way, cascading and compounding natural hazard emergencies can place significant strain on the resources and capabilities of combat agencies during response efforts. These concurrent crises require a coordinated response from multiple agencies and authorities.

The implication for the CZEAS are:

- Multi-hazard environments: Agencies may face erosion, inundation, flooding, and cliff instability all at once, requiring broader coordination.
- Concurrent site demands: Multiple locations may need simultaneous interventions, creating critical decisions on priorities and triage.
- Communication pressure: Rapid, clear information-sharing across agencies and the public becomes critical to avoid confusion or duplication.
- Logistical complexity: Access routes, staging areas, and evacuation options can be compromised by overlapping hazards.

2.3 Coastal Emergencies Covered by the CZEAS

2.3.1 Legislative Requirements

The scope of this CZEAS is dictated by the requirements of the CM Act and the SERM Act.

SERM Act 1989

The SERM Act established the overarching framework for emergency management in NSW. The SERM Act outlines roles and responsibilities for all emergency management in the state, and specifies:

- That emergency management committees are established at the state, regional and local levels.
- That emergency management plans (EMPLANs) are prepared and reviewed at the state, regional and local level.
- Arrangements for controlling emergency operations.
- Responsibilities of emergency operations controllers.

The NSW State EMPLAN 2023 (NSW Office of Emergency Management, 2023) describes the NSW approach to emergency management, the governance and coordination arrangements, and roles and responsibilities of agencies. The plan is supported by hazard specific subplans and functional area supporting plans.



The NSW SES is the designated combat agency for management of floods, tsunamis, and storms, including severe storms which cause coastal erosion. The NSW SES prepares the State Storm Plan, State Flood Plan and State Tsunami Plan, which are subplans to the NSW State EMPLAN 2023.

CM Act 2016

The CM Act identifies specific emergency management considerations associated with beach erosion, coastal inundation, and cliff instability. Section 15 (3) of the CM Act states that:

*“A **coastal zone emergency action subplan** is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to emergencies immediately preceding or during periods of **beach erosion, coastal inundation or cliff instability**, where the beach erosion, coastal inundation or cliff instability occurs through storm activity or an extreme or irregular event”*

Mandatory requirements for a CMP, including the preparation of a CZEAS where required, are identified in Part A of the NSW Coastal Management Manual (OEHL, 2018a).

When preparing a CZEAS, it is crucial to consider the relationship between the coastal management framework established by the CM Act, and the broader NSW emergency management framework. This relationship is depicted in Figure 2-2. To this end, Section 15 (4) of the CM Act states that:

*“A coastal management program **must not** include the following—*

(a) matters dealt with in any plan made under the State Emergency and Rescue Management Act 1989 in relation to the response to emergencies”

The purpose of this clause is to ensure that there is no duplication or ambiguity of emergency response planning, and to ensure that the CZEAS is consistent with the emergency management provisions addressed in the state, regional and local EMPLANS, and state and local flood plans.

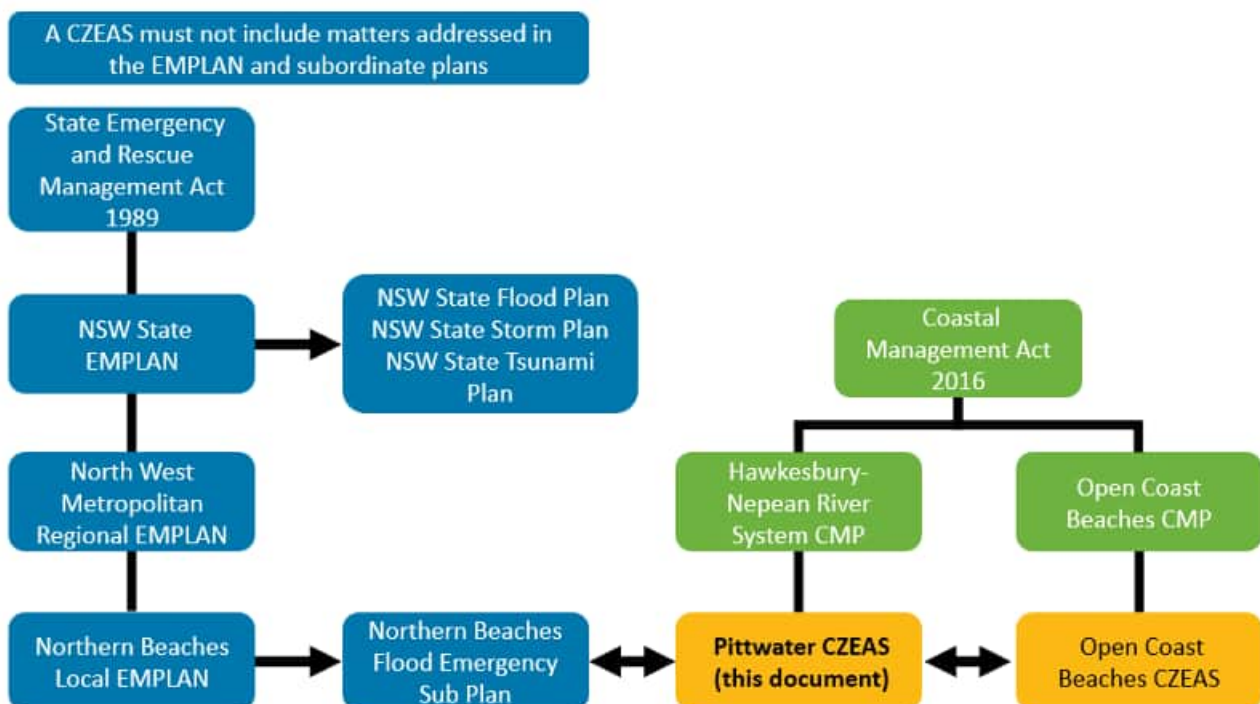


Figure 2-2 Simplified legislative framework for emergency management in NSW and its relationship with coastal management legislation and coastal management programs



2.3.2 Relationship of the CZEAS to other Emergency Plans

The requirements of the CM Act stipulate that this CZEAS must not cover emergencies that are already dealt with by another plan made under the SERM Act.

NSW State Storm Plan

The NSW State Storm Plan (NSW SES, 2023) is a sub plan to the NSW State EMPLAN, and is a comprehensive strategy to effectively prepare for and respond to severe storms across NSW. Section 1.4.3 of the plan states that:

“Coastal erosion caused by storm activity is within the scope of this plan. Emergency management of coastal erosion that is not caused by storm activity will be controlled and coordinated by the Local Emergency Operations Controller (LEOCON)”.

Coastal erosion is therefore within the scope of the NSW State Storm Plan. However, in doing so, the Plan identifies the triggers and instances for when local councils need to activate their CZEAS at a local level. It is in this way that these two emergency planning documents dovetail, without overlapping.

Section 1.4.4 of the State Storm Plan (NSW SES, 2023) states that the arrangements for the emergency management of flooding are dealt with in the New South Wales State Flood Emergency Sub Plan (NSW SES, 2021) – described below.

NSW State Flood Plan

The NSW Flood Plan (NSW SES, 2021) is a sub plan to the NSW State EMPLAN, and sets out the state level multi-agency arrangements for the emergency management of flooding in NSW. Section 1.4.2 of the NSW Flood Plan defines “flooding” as:

“a relatively high-water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake, or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences”.

Subsequently, at a strategic level, the emergency management arrangements for prevention, preparation, response, and initial recovery for still water level coastal inundation is covered by the NSW Flood Plan. At a more regional, level this issue is addressed by the Northern Beaches Flood Emergency Sub Plan (NSW SES, 2021) – described below.

NSW State Tsunami Plan

The NSW Tsunami Emergency Sub Plan (NSW State Tsunami Plan) is a sub-plan to the NSW State EMPLAN. The purpose of the plan is to set out the state-wide multi-agency arrangements for the emergency management of tsunamis in NSW – including the prevention, preparation, response, and initial recovery (including immediate relief) for tsunami activity at the strategic level. The plan accounts for all tsunami magnitudes and generation mechanisms.

The NSW SES is identified in the NSW State EMPLAN and the SES Act as the lead (combat) agency for preparation for and response to tsunami, and for leading the coordinated response to the impact of tsunami including the evacuation of affected communities and immediate relief if required.

Northern Beaches Flood Emergency Sub Plan

The Northern Beaches Flood Emergency Sub Plan (NSW SES, 2021) is a sub plan of the Northern Beaches Local EMPLAN 2021 (Northern Beaches Council, 2021), but specifically covers the local preparedness measures, the conduct of response operations, and the coordination of immediate recovery measures from



flooding within the entirety of the Northern Beaches LGA. The Plan therefore covers land-based flooding across open coast and in estuarine settings of the LGA. The additional arrangements required for wave run-up hazards are therefore covered as part of this CZEAS.

Northern Beaches Open Coast CMP and CZEAS

A CZEAS was developed for the Northern Beaches Open Coast CMP. Whilst this CZEAS is the first to be developed, it is recommended that the Open Coast Beaches CZEAS should be aligned with this CZEAS to the greatest extent practical.

Summary

Table 2-1 and Table 2-2 below provide an overview of the planning hierarchy for coastal hazards across the study area.

Table 2-1 Planning hierarchy for coastal hazards listed in the CM Act across the study area

Coastal Hazard	Strategic Arrangements	Local Operations
Coastal erosion	The NSW State Storm Plan (NSW SES, 2023)	This CZEAS
Coastal inundation – land-based flooding (riverine and overland flow)	The NSW State Flood Plan (NSW SES, 2021)	The Northern Beaches Flood Emergency Sub Plan (Northern Beaches Council, 2021)
Coastal inundation –wave run-up	The NSW State Flood Plan (NSW SES, 2021)	This CZEAS
Coastal cliff and slope instability	The NSW State Storm Plan (NSW SES, 2023)	This CZEAS

Table 2-2 Planning hierarchy for coastal hazards not listed in the CM Act across the study area

Coastal Hazard	Strategic Arrangements	Local Operations
Tsunami	The NSW State Tsunami Plan	The Northern Beaches Flood Emergency Sub Plan (Northern Beaches Council, 2021)



3 TRIGGERS FOR EMERGENCY ACTION

3.1 Overview

For the purposes of this CZEAS, a coastal emergency event within Pittwater is occurring when one or more of the below triggers occurs:

- The following [official hazard forecasts](#) are issued:
 - When the Bureau of Meteorology (BoM) has issued the release of a Coastal Hazard Warning that applies to any of the locations at risk identified in Section 4. More detail regarding these warnings is provided in Section 3.2.
- The following [impact forecasts](#) and assessments are made:
 - In addition to the BoM Coastal Hazard Warning, there are location-specific triggers for when coastal hazards will activate the Response Phase of this CZEAS. These triggers are discussed in Section 3.3. A framework for impact forecast for coastal hazard risk is also provided in Section 3.3.2.

In identifying triggers for erosion protection works, a balance needs to be found between predicted storm erosion and inundation in large events, and avoiding the triggers being reached too often, resulting in “false alarms” and implementation of emergency coastal protection works unnecessarily often.

3.2 Hazard Forecasts

3.2.1 BoM Coastal Hazard Warnings

The actions contained in this CZEAS are triggered by the release of a [Coastal Hazard Warning](#) from the BoM. The BoM issues Coastal Hazard Warnings for abnormally high tides or storm tides that:

- May be higher than the highest astronomical tide, and
- Could flood low lying coastal areas.

The BoM also issues [Severe Weather Warning for Damaging or Dangerous Surf](#) - when the waves are expected to be powerful enough to cause damage to property or significant erosion to beaches.

These warnings are issued whenever a coastal hazard is:

- Happening in an area, or
- Is expected to develop or move into an area.

A Coastal Hazard Warning includes:

- A list of all potential phenomena, coastal forecast districts and locations that may be affected.
- A description of the threat and the area likely to be affected (the threat area).
- The time the warning was issued and what time the next warning will be issued.
- A description of the weather pattern, including forecast developments of significant weather systems.
- A technical summary of all potential phenomena, their timing and likelihood.
- Confirmed observations and reports.
- Recommended actions.



The lead time depends on the weather situation. It can extend from an hour to 36 hours. While the threat remains, a Coastal Hazard Warning is updated routinely every 6 hours. More frequent warnings may be issued if required.

NSW weather warnings are issued by the BoM and can be found at the following link: <http://www.bom.gov.au/nsw/warnings/>. Alternatively, the BoM weather App can show only the weather warnings that apply to the area set by the user.

3.3 Local Impact Triggers and Forecasts

3.3.1 Location Based Triggers

In addition to the official warnings from the Bureau of Meteorology, the NSW State Storm Plan stipulates that the response phase of the storm plan is triggered when information processes or intelligence indicates imminent or actual storm impacts to the community (NSW SES, 2023). For example, if there is no official warning from the Bureau of Meteorology, other evidence may be used to determine that there is a coastal hazard risk to the community that will trigger the actions in this CZEAS, including:

- Verbal advice from BoM forecasters
- Advice issued from the DCCEE Coastal Expert.
- Real-time local monitoring and forecast systems

This is particularly important as there are a number of possible scenarios under which coastal erosion may occur without an official BoM Coastal Hazard Warning being issued. This may include a storm clustering event, where a local beach profile may be depleted from a recent event to the extent that even a relatively low or moderate swell coinciding with a high tide may erode the dune system resulting in landward recession of the erosion escarpment.

Given such complexities, *triggers alone* cannot replace expert engineering judgment. Response decisions must account for real-time conditions, local intelligence, and agency consultation. Therefore, in addition to the Coastal Hazard Warning, location-specific triggers for when coastal hazards will activate the Response Phase of this CZEAS include when:

- **Coastal erosion** is occurring or expected to occur at key locations at risk of beach erosion identified in Section 4, impacting or with potential to impact on public or private assets and/or affect safe access/egress.
- **Wave run-up** is occurring or expected to occur at the key locations at risk of coastal inundation identified in Section 4, affecting/with potential to affect safe access/egress or impacting/with potential to impact on public or private assets.
- A situation in which **instability of coastal cliffs and slopes** is imminent, occurring or has occurred, and the threat of landslide endangers, or threatens to endanger, the safety or health of people or destroys or damages, or threatens to destroy or damage any sites and assets, as identified in Section 4. With regards to coastal cliffs and slopes, an emergency situation is most likely to arise due to periods of heavy and/or prolonged rainfall. It should also be noted that in rare circumstances, coastal cliffs and slopes can experience instability events such as landslips that are triggered by seismic activity, including earthquakes.

In practice, expert engineering judgement would need to be applied at times of storms to assess when to initiate particular actions as required. This approach relies on regular monitoring of environmental conditions and cliff, slope, and beach behaviour – and seeking appropriate advice when required.



3.3.2 Impact Forecast of Coastal Hazard Risk

Whilst the actions contained in this CZEAS are triggered by BoM Coastal Hazard Warnings and location-based triggers, it is also important to monitor coastal environmental conditions at a local level - in order to supplement and inform decision making.

Therefore, it is necessary for Council to monitor additional sources of forecasting and intelligence information to assist in its preparedness for a coastal emergency event (this may also increase the early warning lead time window beyond the notice provided by BoM warnings). Forecasts and real-time data regarding various coastal hazard parameters (such as wave conditions, tide level, and beach state) can provide information on coastal inundation and erosion along coastlines several days in advance of an impending hazard events, potentially providing a “window of opportunity” to implement a range of emergency responses (Matheen & Nashwan, 2022).

Forecasting coastal erosion and inundation is a complex and challenging task due to the fact that it is not solely governed by a single factor, rather an intricate interplay of several variables, including:

- The astronomical tide cycle, and potential magnitude and timing of storm surge.
- Offshore wave height and direction, and the complex nearshore wave transformation processes that will impacts on wave conditions in the nearshore.
- The beach state prior to the onset of the storm. Beaches undergo continuous cyclic evolution in the form of erosion and accretion, and the beach profile at any given instant has an effect on the impact of subsequent storms.

Subsequently, as part of an early warning process, Council should actively monitor forecasts and real-time information related to ocean waves and tides, using the available data sources provided in Table 3-1. Council can also actively monitor the state of their beaches using the tools and data sources provided in Table 3-1, noting that no forecasts are available for beach erosion, and these datasets are limited in their ability to provide real-time (or even near-real time) information.

Table 3-1 Available sources of data for coastal hazard parameters

Parameter	Forecast Source	Forecast Window	Real-time Information
Wave Height	BoM Interactive Weather and Wave Forecast ¹ .	7 days	MHL NSW Ocean Wave Data Collection Program ² .
	The NSW Nearshore Wave Tool ³	5 days	
Ocean Tide	MHL NSW Tide Charts ⁴	1 year	MHL NSW Ocean Tide Data Collection Program ⁵
	BoM New South Wales Tide Tables ⁶	1 year	
Parameter	Historical Data Availability		Data Type
Beach State	Northern Beaches Council Beach Monitoring and Inspections		Photographs, Beach surveys
	CoastSnap (at available beaches)		Photographs
	NSW Beach Profile Database		Beach profiles

¹ <http://www.bom.gov.au/australia/charts/viewer/index.shtml>

² <https://mhl.nsw.gov.au/Data-Wave>

³ <https://nearshore.waves.nsw.gov.au/home/forecast>

⁴ <https://mhl.nsw.gov.au/TideCharts>

⁵ <https://mhl.nsw.gov.au/Data-OceanTide>

⁶ http://www.bom.gov.au/oceanography/projects/ntc/tide_tables.shtml



These data sources can provide a first-pass indication of when beaches may be at risk of coastal erosion and inundation. Using these sources of information, in particular tide and wave forecasts/predictions, a risk framework has been provided in Table 3-2, which indicates potential levels of coastal erosion and inundation risk. The framework adopts:

- Thresholds for offshore significant wave height (Hs) height based on historical wave statistics for the Long Reef Wave Rider Bouy (Shand, et al., 2011) equivalent to:
 - Extreme Wave Conditions: Hs exceeding a 1-year ARI condition of Hs = 5.0 m
 - Moderate Waves: Hs below a 1-year ARI condition of Hs = 5.0 m, but exceeding the 10% exceedance threshold of Hs = 2.5 m.
 - Modal Wave Conditions: Hs below the 10% exceedance threshold of Hs = 2.5 m
- A threshold for elevated water levels of mean high water springs (MHWS), based on the tidal planes at nearby tide gauge such as Patonga (OEH, 2012), which is approximately +0.7 m AHD.

It should be noted that wave butts provide an indication of wave conditions offshore, and that the full wave energy is unlikely to enter the Pittwater waterway. However, it is likely that offshore waves arriving from the [East to North-East sectors](#) will generally provide the most energetic wave conditions inside the estuary.

Table 3-2 Early Warning Parameters for Coastal Erosion and Inundation Impacts

Parameter	Forecast Hs from East to North East Sectors		
	Hs > 5.0 m (> 1-yr ARI)	Hs = 2.5 to 5.0m (10% exceedance to 1-yr ARI)	Hs < 2.5m (<10% exceedance)
Predicted Tide > MHWS (+0.7 m AHD)	High Risk	Moderate Risk	Low Risk
Predicted Tide < MHWS (+0.7 m AHD)	High to Moderate Risk	Low Risk	Low Risk
Risk Levels			
High	- Coastal erosion and inundation risk is high. - Check forecast wave direction to help assess if any particular beaches (or specific beach locations within a beach compartment) may be more severely impacted.		
Moderate	- Coastal erosion and inundation risk is moderate. However, the risk from storm clustering may be <u>high</u> if a beach (or part of a beach) is already in a moderately eroded condition. Check pre-storm beach condition beach using data sources in Table 3-1. - Check forecast wave direction to help assess if any particular beaches (or specific beach locations within a beach compartment) may be more severely impacted.		
Low	- Coastal erosion and inundation risk is lower. However, the risk from storm clustering may be <u>high to moderate</u> if a beach (or part of a beach) is already in a severely eroded condition. Check pre-storm beach condition beach using data sources in Table 3-1. - Check forecast wave direction to help assess if any particular beaches (or specific beach locations within a beach compartment) may be more severely impacted.		



Once the risk of erosion is determined, the risk of damage to infrastructure across the study area should be assessed. Firstly, it should be determined what assets are at risk, as per Section 4. If assets are at risk, it would be necessary to:

- Evaluate the effectiveness of protective works located seaward, which would require knowledge of toe levels, crest levels, and size of the structural elements in the works (such as rock size where applicable).
- Have knowledge of the foundation conditions of the structure (in particular whether the development was founded on deep piles).
- Have undertaken geotechnical investigations in areas known to have a non-sandy subsurface.

3.4 Summary

A summary of each of the triggers for this CZEAS and corresponding sources of information are provided in Table 3-3.

Table 3-3 Summary of triggers for the CZEAS

Hazard	Trigger	Monitoring Parameters	Information Sources
ALL	BoM Coastal Hazard Warning	Warning Issued	BoM Website News Media
Coastal erosion and coastal inundation	Erosion and/or inundation occurring or expected to occur at key locations in Section 4, impacting or with potential to impact on public or private assets.	Beach State	▪ Physical observations ▪ Northern Beaches Council Beach Monitoring and Inspections ▪ CoastSnap (at available beaches) ▪ NSW Beach Profile Database / CoastSat
		Wave Height	▪ BoM Interactive Weather and Wave Forecast and the NSW Nearshore Wave Forecast ▪ MHL NSW Ocean Wave Data Collection Program
		Water Level	▪ New South Wales Tide Tables ▪ MHL NSW Ocean Tide Data Collection Program
Coastal cliff/slope instability	Rainfall forecast (or recorded): ▪ 100 mm + over 24-hours ▪ 150 mm + over 72-hours	Rainfall forecasts Rainfall records	▪ BoM Forecasts ▪ BoM Rain gauge records
	Observed signs impending slope instability	Foreshore state	▪ Physical observations



4 AREAS AT RISK

4.1 Overview

This CZEAS only applies to the known locations affected by beach erosion, coastal inundation or cliff and slope instability as noted in this section.

It is possible that beach erosion, coastal inundation or cliff and slope instability will affect additional locations not currently assessed or known to be risk locations anywhere in Pittwater. In this event, Council should assess these locations and revise this CZEAS to include new locations at risk, as the need arises.

Mapping in Appendix A of this CZEAS depicts mapped coastal hazard extents, including:

- Beach Erosion: The Present Day 1% Annual Exceedance Probability Coastal Hazard Mapping (WRL, 2023)
- Coastal Inundation of estuarine foreshores: The Hawkesbury River Coastal Inundation Study (Rhelm and Baird, 2023)

4.2 Local Hazard Exposure

Based on analysis of the datasets listed above, Table 4-1 summarises the risks of beach erosion and coastal inundation at the 6 beaches. It should be noted that hazard information for The Basin Campground is unavailable; therefore, a more generalised risk assessment has been applied for this location to guide emergency response actions.

Similarly, hazard information for coastal cliff and slope instability across Pittwater is currently unavailable (Water Technology, 2020). As such, risks associated with these processes have not been quantified within this CZEAS.



Table 4-1 Summary of risks of coast hazards

Beach	Beach Erosion	Coastal Inundation	Overall Risk
Station Beach Figure A-1 to A-3	There is little impact of beach erosion on public and private infrastructure along the beach due to protection from Barrenjoey Headland. At northern station beach there is a NPWS shed and cottage that is at risk. In central Station Beach there is the Station Beach carpark and beach access amenities, as well as Palm Beach Gold Club. At southern Station Beach there are some private properties (Waratah Road) along the southern part of the beach that have protection from revetment works.	At northern station beach there is a NPWS shed and cottage that is at risk. Most of the central and southern part of Station Beach includes Palm Beach Golf Club with no significant infrastructure that would be inundated other than the jetty and The Joey restaurant. There are also 6 private properties (Waratah Road) that would be impacted by coastal inundation in a 1% AEP event.	Medium – little impact from beach erosion, with NPWs assets, The Joey restaurant and 6 private properties impacted by coastal inundation in a 1% AEP event
Snapperman Beach Figure A-4	The northern and southern parts of the beach have revetment works for protection. However, there are approximately 18 private properties adjacent to Barrenjoey Road and Iluka Road where extreme storm events (1% AEP) will incise into properties possibly causing scarping and building instability.	There are approximately 25 waterfront properties that would have some inundation impact in a 1% AEP event. These properties are either adjacent to Barrenjoey Road or Iluka Road. Also impacted would be public infrastructure including the Palm Beach Wharf (managed by Northern Beaches Council) and Pittwater Park & Playground	High – 18 properties at risk of beach erosion impact and inundation impacts to 25 private properties and public infrastructure.



Beach	Beach Erosion	Coastal Inundation	Overall Risk
Sandy Beach Figure A-5	Most properties along Sandy Beach are built well back from the beach and the beach frontage verge acts as a buffer against beach erosion in events less than the 1% AEP. There are 9 properties on the northern section of the beach with buildings closer to beach that may need for emergency works (e.g. sandbagging) to protect these foreshores in extreme events.	All properties along Sandy Beach are built well back from the beach and the beach frontage verge acts as a buffer against direct inundation in a 1% AEP event. There are 5 properties on the northern section of the beach that may be slightly impacted by coastal inundation.	Medium – properties on northern part of the beach may require emergency erosion protection works in extreme events, whilst almost all properties will not be inundated in extreme events.
The Basin Campground Figure A-6	There is no erosion hazard mapping for The Basin; however, the foreshore campground infrastructure would be impacted by beach erosion in a 1% AEP event. There may be the need for sand nourishment along the beach after extreme events.	Almost all the campground infrastructure would be inundated in a 1% AEP event.	Low - The Basin is part of Ku-ring-gai National Park and, as such, is under NPWS land tenure. NPWS should have an emergency plan for the campground which should relate to the impacts of coastal inundation e.g. evacuation of campers.
Currawong Figure A-7	The foreshore infrastructure will be impacted in a 1% AEP event and the main cottage may need emergency works to protect it in extreme events. There also may be the need for sand nourishment along the beach after extreme events.	Whilst the grounds of the State Park and wharf are inundated in a 1% AEP event, the Cottages are not inundated in this event.	Low - This site includes the heritage-listed Currawong Cottages. Currawong State Park should have emergency management plan. Possible need for emergency works to protect the main cottage in extreme events.
Great Mackerel Figure A-8	All foreshore properties will be impacted by beach erosion both in 2% AEP and 1% AEP events. Of particular concern are 5 foreshore properties to the north of the beach where erosion related to extreme events could undermine buildings.	Approximately 20 properties are impacted by coastal inundation during a 1% AEP event. Half of these properties front the beach (Ross Smith Parade) with the remainder along a small creek (near Diggers Crescent) which is impacted by a breakout to the north of the beach flowing back up the creek.	Very High – this is an isolated community with possible loss of telecommunications during a storm event. The only access is via boat which could be impossible during an extreme event. Beach erosion and coastal inundation can be coupled with flooding from the land impacting at least 60 properties.



5 ROLES AND RESPONSIBILITIES

5.1 Agencies and Personnel

The general responsibilities of emergency services organisations and support agencies are listed in the Local and State EMPLANS, such as the NSW State Storm Plan (NSW SES, 2023), NSW State Flood Plan (NSW SES, 2021), and the Northern Beaches Flood Emergency Sub Plan (NSW SES, 2021). Table 5-1 summarises the roles and responsibilities of these stakeholders that are specifically relevant to this CZEAS.

It should be noted that private landholders are responsible for private land. Private property owners have responsibilities to monitor, manage, prepare and repair their properties for risks associated with coastal erosion, inundation and cliff and slope instability. Any physical works on private property are subject to development controls and environmental planning instruments, including the Northern Beaches Development Control Plan. Private property owners should notify Council immediately of any concerns outside of their property; however, property owners should seek advice directly from suitably qualified geotechnical and/or coastal engineers with regards to instability concerns within their property boundaries. Council does not have a positive obligation to take particular action to protect private property. There is, however, a statutory obligation upon Council to consider any valid development application for coastal protection works which may be lodged by property owners.

Table 5-1 Roles and Responsibilities

Organisation / Personnel	Responsibilities
Northern Beaches Council	▪ Prepare, maintain, and update this CZEAS (NSW SES, 2023). ▪ Provide the NSW SES with a copy of this CZEAS (NSW SES, 2023). ▪ Assist the NSW SES with community awareness programs to ensure people in locations potentially threatened by coastal erosion, inundation, and cliff/slope instability understand the threat and its management (NSW SES, 2023). ▪ <u>Prevention & Preparation</u>: Implement the Prevention and Preparation Phase emergency actions prior to a coastal emergency event occurring. ▪ <u>Response</u>: In the event of a coastal emergency at a location at risk, activate this CZEAS and implement the Response Phase emergency actions for the duration of the coastal emergency event. ▪ <u>Recovery</u>: Implement the Recovery Phase emergency actions following a coastal emergency event. ▪ Under the CM Act, Council is the designated coastal authority with responsibility for care of public land within its care, control, and management. The carrying out (or authorising and coordinating) of coastal emergency protective works to protect public assets from coastal erosion, inundation, and cliff/slope instability is Council's role, if it chooses to undertake such measures. ▪ Assist, at their request, NSW Police, NSW SES, and Local Emergency Operations Controller (LEOCON) in dealing with a coastal emergency. ▪ Liaise with the NSW SES Incident Controller to provide advice regarding the need for response actions by the NSW SES such as evacuations.
Local Emergency Management Committee (LEMC)	▪ The LEMC is constituted under the SERM Act for each local government area and is responsible for preparing plans for response and recovery from emergencies. ▪ The LEMC is chaired by the Chief Executive Officer or their nominated representative from Northern Beaches Council. Represented on the LEMC are combat agencies including:



Organisation / Personnel	Responsibilities
	– Police. – Rural Fire Service. – Fire and Rescue NSW. – State Emergency Services. – Surf Life Saving NSW. – Marine Rescue. ▪ The LEMC will review the Northern Beaches Local EMPLAN every three (3) years, or following any: – activation of the Plan in response to an emergency; – legislative changes affecting the Plan; – exercises conducted to test all or part of the Plan; – In the event of that deficiencies are identified; or – Change of roles and responsibilities.
Local Emergency Operations Controller (LEOCON)	▪ Monitor coastal emergency event operations. ▪ Act as the combat/responsible agency in the event of: – Coastal erosion that is not caused by direct storm activity, as per Section 1.4.3 of the NSW State Storm Plan (NSW SES, 2023); or – Coastal cliff and slope instability ▪ Coordinate support to the NSW SES Local Incident Controller, if requested to do so.
Northern Beaches Council Local Emergency Management Officer (LEMO)	▪ If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations. ▪ Provide executive support to the LEMC and LEOCON in accordance with the Northern Beaches Local EMPLAN.
Regional Emergency Operations Controller (REOCON)	▪ The REOCON is responsible for the overall control and coordination of emergency response operations at Region level for which the REOCON is the designated controller. ▪ The REOCON is also the designated controller where there is no designated Combat Agency, or where it is necessary to coordinate two or more local level operations which are controlled by Emergency Operations Controllers, or when directed by the SEOCON. ▪ The REOCON is responsible, when requested by a combat agency, to co-ordinate the provision of resources support.
State Emergency Operations Controller (SEOCON)	▪ Responsible for the control and coordination of emergency response operations at State level, for which the SEOCON is the designated Controller or where there is no designated Combat Agency. ▪ Provide advice to the Minister regarding emergencies, including whether or not a declaration of a 'State of Emergency' may be necessary. ▪ Consider requests for State or Commonwealth assistance. ▪ Coordinate the establishment of a Major Evacuation Centre in accordance with Major Evacuation Centre Guidelines if required.
NSW State Emergency Service (NSW SES) Local Unit Members	▪ Act as the combat/responsible agency for damage control and the coordination of community evacuation during the following coastal zone hazards as per the Northern Beaches Local EMPLAN:



Organisation / Personnel	Responsibilities
	– Flooding. – Storms. – Tsunami. ▪ Act as the combat/responsible agency in the event of coastal erosion that is caused by storm activity (NSW SES, 2023). ▪ NSW SES roles and responsibilities in relation to storms and coastal erosion are detailed within the NSW State Storm Plan (NSW SES, 2023), and where relevant the NSW State Flood Plan (NSW SES, 2021). Responsibilities may include: – Assist in the collection of flood and coastal erosion/inundation information for the development of intelligence. – Evacuation. – Delivery of warnings. – Assisting with road closures and traffic control operations. ▪ The NSW SES is not authorised to undertake emergency coastal protection works such as placement of rock armour or geotextile sand containers. ▪ Undertake preparedness education related to its legislated responsibilities of flood, storm, tsunami, and earthquake.
NSW SES Incident Controller	▪ Deal with floods as per the Northern Beaches Flood Emergency Sub Plan (NSW SES, 2021) ▪ Identify and monitor people and/or communities at risk of flooding and coastal erosion. ▪ Provide an information service in relation to: – Coastal erosion. – Coastal inundation. – Road conditions and closures (general information only). – Warning products in line with the AWS. ▪ Direct the evacuation of people and/or communities. ▪ Ensure caravan parks are advised of flood/coastal inundation warnings. ▪ Coordinate the collection of flood and coastal erosion/inundation information for development of intelligence.
NSW Rural Fire Service (RFS)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ Identify and notify the NSW SES of any locations at risk of fire or hazardous materials that pose a significant threat to surrounding populations due to the impact of a flood for incorporation into NSW SES flood intelligence and planning. ▪ Conduct HAZMAT operations including asbestos risks, arising from flood and storm emergencies in coordination with the SES Incident Controller. ▪ Assist the NSW SES with the: – Delivery of warning products in line with the AWS, and the conduct of evacuations. – Warning and/or evacuation of at-risk communities. – Monitoring/reconnaissance of flood prone areas. ▪ Provide equipment for pumping flood water out of buildings and from low-lying areas. ▪ Assist with clean-up operations, including the hosing of flood affected properties.



Organisation / Personnel	Responsibilities
Ambulance Service of NSW	- The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan (NSW SES, 2021). Roles and responsibilities in addition those include: - Participate in NSW SES briefings, training & exercises as required. - Provide a Liaison Officer to the NSW SES State Command or Incident Control Centre/s as required. - Provide Incident Management Personnel and Liaison Officers to the NSW SES where required.
Australian Government Bureau of Meteorology (BoM)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: - The BoM issue public weather and storm warning products before and during a storm (NSW SES, 2023). These may include: - Coastal Hazard Warnings - Severe Thunderstorm Warnings. - Severe Weather Warnings. - Tropical Cyclone Watches. - Tropical Cyclone Warnings. - Coastal Strong Wind, Gale Storm and Hurricane Force Warnings. - Flood Watches and Flood Warnings. - Provide weather and flood information directly to the NSW SES, LEMC and relevant agencies (NSW SES, 2021).
Marine Rescue NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: - When requested by NSW SES, assist in flood operations when training and equipment are available and suitable including assistance with: - Warning and/or evacuation of at-risk communities. - Providing communications personnel. - Property protection tasks including sandbagging. - Flood rescue operations
NSW Department of Climate Change, Energy, the Environment and Water	DCCEEW is the NSW government authority responsible for advising on coastal zone management. Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: - Advise the NSW SES about conditions which may lead to coastal erosion; - Provide storm damage response teams to assist the NSW SES and National Parks and Wildlife Service. - Provide related advice on coastal hazards to the NSW SES on request.
NSW National Parks and Wildlife Service	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: - Assist the NSW SES with identification of road infrastructure in National Parks at risk from storms. - Close and reopen NPWS managed roads when affected by storms and advise the NSW SES of its status. - Facilitate the safe reliable access by emergency resources on NPWS managed land and roads.



Organisation / Personnel	Responsibilities
	Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.
NSW Police Force	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: - Provide Incident Management personnel and Liaison Officers to the NSW SES Operation Centre if required. - When requested by LEOCON, act as the response agency for coastal cliff and slope instability - When requested by NSW SES in storm operations: - Restrict access to areas affected by storms. - Assist with warning and/or evacuation of at-risk communities. - Provide specialist storm damage response teams to assist the NSW SES if available. - Assist with monitoring and reconnaissance of areas potentially damaged by storms. - Coordinate search and rescue operations. - Conduct road and traffic control operations in conjunction with NSW SES, Council and/or TfNSW. - Coordinate security of supply lines for evacuated and damaged areas. - Manage Disaster Victim Registration. - Operate the Public Information and Inquiry Centre, if requested or otherwise needed during flood events.
Transport for NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: TfNSW (Maritime), following the direction of the NSW Police Force will assist in the identification and recovery of vessels.

5.2 Combat Agencies

It is important to note that the NSW State Storm Plan (NSW SES, 2023) and the North West Metropolitan Regional EMPLAN (NSW SES, 2023) identify different combat agencies are responsible for different types of coastal hazard - and that this also varies depending on whether or not the emergency event is occurring within or outside of a storm event. This information is summarised in Table 5-2.

Table 5-2 Combat agencies for coastal hazard events

Coastal hazard	Storm Event	Non-Storm Event	Reference
Coastal erosion and inundation	NSW SES	LEOCON	NSW State Storm Plan
Coastal cliff and slope instability	LEOCON	LEOCON	Noth West Metropolitan Regional EMPLAN



5.3 Emergency Operation Centres

An Emergency Operations Centre (EOC) is a centre established at State, Region, or Local level as a centre of communication and as a centre for the coordination of operations and support during an emergency. In NSW, the activation of an EOC is triggered by various factors depending on the nature and severity of the emergency or incident. Emergencies that exceed the capabilities of individual agencies or require a coordinated multi-agency response may prompt the activation of the EOC to manage resources and coordination effectively.

As per the NSW State EMPLAN (NSW Office of Emergency Management, 2023):

- The SEOCON is responsible for establishing and controlling a State Emergency Operations Centre (SEOC)
- The REOCON is responsible for establishing and controlling a Regional Emergency Operations Centre (REOC)
- The LEOCON is responsible for establishing and controlling a Local Emergency Operations Centre (LEOC)



6 COMMUNICATION PROTOCOLS

6.1 Overview

Council will provide information about anticipated coastal emergency events to impacted communities through the following mechanisms provided in Table 6-1.

Table 6-1 Communication Protocols

Communication	
	Provide routine emergency management briefings to communicate the strategy outlined in this plan including coastal emergency triggers, areas at risk, roles and responsibilities and response action plan.
	- Provide emergency management information (in the form of signage and brochures) at local community centres and community information hubs. - Inform the community of Council's intended erosion emergency responses under this CZEAS. - Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for coastal hazards.
	- In consultation with the NSW SES and BoM, provide public information about approaching coastal emergencies where possible through digital means including social media. - Provide emergency management briefings to the public as needed, in particular affected landholders, to communicate the strategy outlined in this CZEAS, including coastal emergency event triggers, locations at risk, roles and responsibilities and the emergency response actions, including what actions a landholder may need to take and any assistance that may be available to them. - Coordinate with the NSW SES to ensure residents are aware of urgent hazards during emergency events and provide assistance with door-to-door communication as necessary. - See Section 6.2 for more information about message construction.
	- Place barriers and signage at Council-managed beach access tracks that are closed due to the impacts of coastal erosion, inundation and/or cliff/slope instability. - Provide up to date information on Council's website regarding Council-managed beach access tracks closures and re-openings.

6.2 Message Construction

6.2.1 The AWS Framework

As per Section 6.1, Council is to consult with the NSW SES and BoM, in order to help provide public information about approaching coastal emergencies.

The design of Council's external messaging during an emergency event should be aligned with the Australian Warning System framework (AIDR, 2021) – which is a new national approach to information and warnings during emergencies like bushfire, flood, storm, extreme heat, and severe weather. Up until now there have been different warning systems for different hazard types across Australia. The new Australian Warning

System aims to provide consistent warnings to Australian communities so that people know what to do when they see a warning level. There are three warning levels, provided in Table 6-2, as per AIDR (2021).

Table 6-2 Warning Levels from the Australian Warning System framework (AIDR, 2021)

Alert Level	Description
Advice (Yellow)	An incident has started. There is no immediate danger. Stay up to date in case the situation changes.
Watch and Act (Orange)	There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.
Emergency Warning (Red)	An Emergency Warning is the highest level of warning. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

The Australian Warning System utilises a system of triangular hazard icons with escalating tiers and associated colour palettes. Specific icons have been developed for bushfire, flood, storm, extreme heat, and severe weather, as per Figure 6-1 below. It is recommended that the following icons are used:

- “Storm” icon – for coastal erosion, coastal inundation, and coastal cliff and slope instability that are jointly occurring with storm events.
- “Other” icon – for coastal erosion and coastal cliff and slope instability that does not directly coincide with storm events (as these two hazards may also occur in the aftermath of a specific storm event).

The Australian Warning System utilises a nested model for communications that includes the warning level + hazard / location + action statements – as per Figure 6-1. Each warning level has a set of action statements to give the community clearer advice about what to do. Calls to action can be used flexibly across all three warning levels and contextualised for each hazard for a given location. Table 6-3 provides some examples of the Australian Warning System’s “calls to action” input (AIDR, 2021) that may be useful in a coastal emergency.



Figure 6-1 Australian Warning System messaging model (top) and hazard icons (AIDR, 2021)



Table 6-3 Examples of Australian Warning System calls to action (AIDR, 2021) that may be used in a coastal emergency

Advice	Watch and Act	Emergency Warning
- Prepare now - Stay informed - Monitor conditions - Threat is reduced - Avoid the area - Return with caution	- Prepare to leave/evacuate - Leave/evacuate now (if you are not prepared) - Prepare to take shelter - Move/stay indoors - Stay near shelter - Walk two or more streets back - Monitor conditions as they are changing - Move to higher ground (away from creeks/rivers/coast) - Limit time outside - Avoid the area - Stay away from damaged buildings and other hazards - Prepare for isolation - Do not enter flood water - Not safe to return - Prepare your property	- Leave/evacuate (immediately, by am/pm/hazard timing) - Seek/take shelter now - Shelter indoors now - Too late/dangerous to leave

6.2.2 Message Communication

According to the Australian Disaster Resilience Handbook (AIDR, 2009):

'the best predictions, the best interpretive material and the best warning messages are of little value if they have no impact on damages or safety. Failure is guaranteed if warning messages based on ... predictions and interpretations ... are not conveyed effectively to those expected to respond. In essence, a warning which is not communicated effectively is no warning at all if it is not heard or heeded'.

The handbook identifies two different types of message communication based on target audience:

1. General warnings are disseminated ('broadcast') to whole communities or regions.
2. Specific warnings are intended for individuals or parts of communities and reflect the need for 'narrowcasting' to specific audiences who may have specific characteristics or be at different kinds of risk.

A combination of the following warning methods may be utilised:

- Internet – including authorised social media and the official Council website.
- Mobile and fixed public address systems
- Two-way radio
- Emergency Alert
- Telephone/fax
- Doorknocking



- Variable message signs
- Community notices in identified hubs
- Distribution through established community liaison networks/partnerships

Emergency Alert is a national telephony-based alert system used by emergency service agencies to send voice messages and short message service (SMS) to landline/mobile telephones in times of emergency. Where appropriate and usually in conjunction with other warning messages, Emergency Alert is used to send SMS/voice alerts to landline and mobile telephones in a specified geographic area. The emergency alert system should be used in conjunction with the three levels of emergency warning depicted in Figure 6-1.



7 EMERGENCY RESPONSE ACTION PLAN

7.1 Overview

This section outlines what actions are to be undertaken in the four phases of emergency management at each of the locations at risk that this CZEAS applies to.

- **LGA-wide Actions:** Section 7.2 summarises the coastal emergency actions through the four phases of emergency management, which apply to the locations at risk along the entire study area.
- **Site-Specific Actions:** In addition to the LGA-wide actions specified in the table below that would apply generally to all areas impacted by a coastal emergency, site-specific emergency actions that would apply to particular locations are outlined in individual site plans in Appendix A.

Council and NPWS ability to undertake the actions identified in this CZEAS will be dependent on the availability of resources during emergency events.

All actions must not put personnel, staff or volunteers in danger. Emergency management works must not be undertaken during extreme weather unless environmental conditions permit works to be undertaken safely. Implementation of the actions outlined in this document are to be undertaken in accordance with the provisions of Council and NPWS' respective Work Health and Safety Management System. The safety of the personnel who might be working under the extreme adverse weather conditions that gave rise to the emergency is to be prioritised over the execution of any actions outlined in this document. The implementation of an applicable safety hazard risk assessment is required prior to the undertaking of any intervention or non-intervention management measures.

Actions in this CZEAS aim to reduce risk:

- In areas where Council has chosen not to implement other coastal protection works to reduce coastal hazard risks, which have been evaluated as tolerable or acceptable.
- Where coastal hazard risks persist because an agreed action in this CMP has not yet been implemented.
- In situations where coastal hazard risks persist even after the implementation of other actions, leading to what is termed as residual risk.
- When rare and large or unexpected events occur, outside the design criteria or capacity of agreed management actions in this CMP.

7.2 Study Area Wide Actions

The following tables set out the LGA-wide emergency actions to be undertaken across the four phases of emergency management: Prevention, Preparedness, Response, and Recovery. These actions provide a consistent framework for managing coastal hazard risks across all locations within the study area, ensuring clarity around responsibilities, timing, and operational priorities. Site-specific actions for individual locations are provided separately in Appendix A.



Table 7-1 Coastal Emergency Actions: Phase 1 – Prevention

Action	Description	Responsibility	Timing
1.1	<u>Inform:</u> Make this CZEAS available to all relevant stakeholders identified in Section 5.	Council, NPWS	Ongoing
1.2	<u>Inform:</u> Provide advice to the community, landholders, and the NSW SES about the potential for a coastal emergency from beach erosion, coastal inundation or cliff or slope instability – and the types of responses that are and are not permitted.	Council	Ongoing
1.3	<u>Inform:</u> Inform the community of Council's intended erosion emergency responses under this CZEAS.	Council	Ongoing
1.4	<u>Review:</u> Through the Local Emergency Management Committee (LEMC), consult with SES, DCCEEW, Local Police, LEOCON, FRNSW to ensure this CZEAS remains consistent the relevant local, regional, and state-based emergency management plans.	Council	Within 6 months of EMPLAN updates
1.5	<u>Review:</u> Review and update this CZEAS in line with any future updates to the CVA Mapping or CMP implementation.	Council, NPWS, NSW SES	Ongoing
1.6	<u>Review:</u> Assess threats to life and property arising from a coastal emergency through the CMP process.	Council, NPWS	During CMP preparation and review.
1.7	<u>Plan:</u> Apply development controls to developments in the coastal hazard areas in accordance with the Northern Beaches LEP and DCP.	Council	Ongoing
1.8	<u>Plan:</u> Obtain the necessary approvals to allow Nature Assisted Beach Enhancement (NABE) to be carried out in those areas where public infrastructure is at risk. An overview of NABE methods and approaches are provided in Appendix B.	Council, NPWS	Ongoing
1.9	<u>Plan:</u> Develop an early warning system for this CZEAS by formalising the processes set out in Section 3.4 and dovetailing them with Council's internal and external communications protocols and policies.	Council	Ongoing
1.10	<u>Plan:</u> Develop protocols between Council, NPWS, and NSW SES and LECON in relation to operational activities for situations where an Emergency Operations Centre (EOC) is not established.	Council, NPWS	Ongoing



Action	Description	Responsibility	Timing
1.11	Plan: Establish internal operational protocol and procedures for all coastal hazard scenarios for LEMO, Council's coastal officers and works crews, and communications staff.	Council, NPWS	Ongoing

Table 7-2 Coastal Emergency Actions: Phase 2 – Preparedness

Action	Description	Responsibility	Timing
“Sunny Day” Preparedness			
2.1	Inform: Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for coastal hazards.	Council	Ongoing
2.2	Inform: Inform Council and NPWS staff (respectively) about the emergency responses within this plan and ensure relevant personnel have the copies of the plan.	Council, NPWS	Ongoing
2.3	Plan: The LEMC will review the Northern Beaches Local EMPLAN every three (3) years as per Table 5-1 to ensure interoperability preparedness.	LEMC	Ongoing
2.4	Plan: Prepare an up-to-date list of contact details for key Council and NPWS staff involved in coordinating actions under the CZEAS (include responsibilities of staff who prepare for, manage and coordinate recovery from an erosion emergency event) and individuals from whom Council may need advice, such as DCCEE staff, or with whom to integrate from other emergency sectors).	Council, NPWS	Ongoing
2.5	Plan: Prioritise planning and response to maximise (to the greatest extent practical) continued functionality for essential infrastructure during an emergency event.	Council, NPWS	Ongoing
2.6	Plan: Develop an operations procedure to guide Council and NPWS response to coastal emergency events (including resourcing, internal training, testing and periodic review).	Council, NPWS	Ongoing
2.7	Monitor: Undertake regular monitoring of coastal conditions, tide, wave height, rainfall, and weather condition forecasts for indication of approaching coastal hazards, as per Table 3-1 and Table 3-2.	Council, NPWS	Ongoing



Action	Description	Responsibility	Timing
Precaution Preparedness - where of triggers for Response Phase are anticipated			
2.8	Plan: Ensure signage to close public foreshore access tracks and other public areas, and signage warning pedestrians of coastal hazards risks are available for use during coastal emergencies.	Council, NPWS	Ongoing
2.9	Plan: Ensure appropriate plant, equipment and experienced personnel are available for protection of assets at risk. Both internal and external personnel will be required based on specific scope of works.	Council, NPWS	Ongoing
2.10	Monitor: Undertake regular monitoring of hazard forecasts (see Section 3.2) and local forecasts and triggers (see Section 3.3) that may activate the Response Phase.	Council, NPWS NSW SES	Ongoing

Table 7-3 Coastal Emergency Actions: Phase 3 – Response

Action	Description	Responsibility	Timing / Trigger
3.1	Monitor: Undertake regular monitoring of hazard forecasts (see Section 3.2) and local forecasts and triggers (see Section 3.3) that may activate the Response Phase	Council, NPWS NSW SES	Ongoing
3.2	Plan: The LEMC (inc. Council LEMO) should consider Council advice regarding consider Warnings and Triggers, and advice provided by the NSW BoM. From here SEOCON, REOCON, LEOCON and NSW SES to are decide on the emergency management process (supported by Council). This may include the establishment of an Emergency Operations Centre (EOC).	SEOCON, REOCON, LEOCON, NSW SES	Response phase activated.
3.3	Plan: No actions undertaken should impede, conflict, or overlap with those of response agencies under the SERM Act unless there is prior agreement between the relevant parties.	Council, NPWS	Response phase activated.
3.4	Communicate: Implement the communication protocol in conjunction with the combat agency (NSW SES) to advise landholders, residents, public	Council, NPWS NSW SES	Response phase activated.



Action	Description	Responsibility	Timing / Trigger
	authorities and other organisations that a coastal emergency is likely or is occurring and that actions in this CZEAS are to be implemented. When EOC not in place, communications are to be directed through the communications business partner for the Coastal Management Unit. LEMO to be copied into all communications for oversight (see Figure 1-2). Release media information as necessary to keep the community informed. Community information hubs and social media to be utilised, refer to Section 6.		
3.5	Prepare: Place appropriate equipment on standby (back up radios, signs, and barricades etc.).	Council, NPWS	Response phase activated.
3.6	Monitor: At locations that are impacted – or expected to be impacted - by coastal hazards, undertake monitoring of beach state and coastal hazard conditions on a daily basis (minimum), preferably during high tide. This includes monitoring: ▪ The need for barriers and safety signage to be erected at damaged and potentially dangerous beach access points, to minimise risk to public safety. ▪ The need to remove existing beach signage, bins, beach access infrastructure, and dune fencing where threatened by coastal erosion (and removing these assets where safe to do so to prevent damage or being washed away). ▪ The need to enact other response measures.	Council, NPWS	Response phase activated. Only if/when safe to do so.
3.7	Monitor: Undertake monitoring of identified coastal cliff and slope instability risk areas on public land.	Council, NPWS	Response phase activated. Only if/when safe to do so.
3.8	Close Roads: Initiate erection of safety barriers or safety signage across potentially dangerous access points on roads assessed within the CZEAS to be vulnerable to coastal hazards. ▪ Refer to the coastal hazard maps in Appendix A and specific locations listed in Section 4 of this CZEAS as a guide to assess locations where action such as road closures will be required. Sections of roadway that	Council, NPWS	Act if roads or vehicle access tracks are unsafe due to: ▪ Coastal erosion resulting in instability or undermining.



Action	Description	Responsibility	Timing / Trigger
	may be subject to inundation that pose a high public safety risk should be temporarily closed to public access. This can be done through erection of temporary barricades, cyclone fencing and/or signage Council will coordinate the closure and reopening of council managed roads once inspections have been carried out by the relevant authority.		Coastal inundation, wave run-up and overtopping likely to cause or likely to cause inundation of areas.
3.9	Close Foreshore Access: Close access to public foreshore reserves, public lookouts, and other public areas. Erect barricades and signs, as necessary. Refer to Appendix A for locations of foreshore areas. - Install temporary fencing and/or signage on council managed land (e.g. foreshore reserves) affected by coastal inundation or erosion resulting from major storm activity or an extreme or irregular event, where this has resulted in unsafe conditions - Undertake inspection of these areas where it is safe to do so and inform the NSW SES of any intelligence on unforeseen impacts of coastal inundation gathered during the emergency. In a potential emergency event, the foreshore areas listed in Table 4-1 should be inspected daily, particularly at high tide, where resources permit. Work with NSW SES and NSW DCCEEW-CPHR to collect data during and after coastal inundation events (e.g. RTK survey of debris lines, photographs of inundated or eroded areas). - Assist the NSW SES to enact closure of access points that the NSW SES Incident Controller has deemed to be unsafe and that may not have been identified as specific locations of coastal erosion or inundation risk within this CZEAS.	Council, NPWS	Act if public beach access track is unsafe due to: - Damaged access track structure, steps, slats, platforms, posts etc. - Where access terminates at a beach erosion scarp greater than 1 m in height. - Dangerous waves or excessive wave run-up progressing into access tracks. - Otherwise deemed unsafe.
3.11	Manage Essential Infrastructure: Through consultation with utilities providers assess the requirement and options for utilities management where such infrastructure becomes or is likely to become affected by coastal hazards. Erect barricades and signs, as necessary.	Council	As required.
3.12	Respond: Seek specialist coastal engineering advice where required.	Council, NPWS DCCEEW	As required.



Action	Description	Responsibility	Timing / Trigger
3.13	Respond: Seek advice from DCCEE staff as required.	Council, NPWS, DCCEE	As required.

Table 7-4 Coastal Emergency Actions: Phase 4 – Recovery

Action	Description	Responsibility	Timing / Trigger
4.1	Monitor: Conduct/organise detailed inspections of sites potentially affected by coastal hazards and assess damage to assets and the natural environment. Assess the structural integrity of any damaged infrastructure. Seek professional advice as required.	Council, NPWS	Following an emergency event. Once it is safe to do so.
4.2	Close Foreshore Access: Access to remain closed until foreshore regrades naturally and foredune has recovered. Continue temporary safety fencing and associated warning signage as necessary.	Council, NPWS	Where the beach scarp is exceedingly high and impractical to collapse to 1V:4H.
4.3	Restore: Where beach erosion has generated a vertical erosion escarpment of greater than 1 m in height that presents a risk to assets or has created unsafe access, Council will take action to make the area safe. This may include regrading the escarpment to slope of 1V:4H with machinery or other available means. Take care not to damage dune vegetation.	Council, NPWS	Following an emergency event. Once it is safe to do so. Act if foreshore access is unsafe due to: A vertical erosion escarpment of greater than 1 m in height.



Action	Description	Responsibility	Timing / Trigger
4.4	Restore: Arrange for the repair of public beach access tracks. If the access track cannot be restored safely, or where restoration is not viable considering the social, economic, and environmental impact - it should be permanently closed and removed from Councils asset register.	Council, NPWS	Following an emergency event. Once it is safe to do so Act if public beach access track is unsafe due to: ▪ Damaged access track structure, steps, slats, platforms, posts etc. ▪ A vertical erosion escarpment of greater than 1 m in height. ▪ Dangerous waves or excessive wave run-up progressing into access tracks. ▪ Otherwise deemed unsafe.
4.5	Restore: Remove, replace, or repair minor infrastructure (e.g., picnic facilities, garbage bins etc.) that have been impacted on by storm events where required.	Council, NPWS	Following an emergency event. Once it is safe to do so.
4.6	Restore: Removal of beach/storm debris that poses high risk to public safety, and associated contemporary risk assessment on a site-by-site basis.	Council, NPWS	Following an emergency event. Once it is safe to do so.
4.7	Restore: Restore access to beaches and headlands.	Council, NPWS	Following an emergency event. Once it is safe to do so.
4.8	Restore: Undertake NABE and dune management to enhance post-storm recovery – and in line with the Local Area Plans for specific beaches set out in Appendix A. An overview of NABE methods and approaches are provided in Appendix B.	Council, NPWS	Following an emergency event. Once it is safe to do so
4.9	Monitor: Investigate any unauthorised coastal works and monitor as necessary.	Council	Response phase activated.
4.10	Inform: Continue to maintain a communication strategy warning of the dangers of any persisting high, unstable, or near-vertical erosion escarpments drying out and collapsing without notice.	Council, NPWS	Following an emergency event. Once it is safe to do so.



Action	Description	Responsibility	Timing / Trigger
4.11	Inform: Liaise with property owners to ensure any private and/or public structures do not pose a risk to the public.	Council	Following an emergency event.
4.12	Inform: If necessary, issue orders under the Local Government Act 1993 and/or the <i>Environmental Planning and Assessment Act 1979</i> when properties are deemed structurally unsafe or pose a risk to the public.	Council	As required.
4.13	Record: Record coastal emergency impacts and response actions. Take remedial action where necessary. Maintaining photographic and written records of events and decision-making processes. See Section 7.3.	Council, NPWS	Following an emergency event. Once it is safe to do so.
4.14	Inform: Erect permanent warning signs if necessary.	Council, NPWS	Following an emergency event.
4.15	Restore: Replenish any emergency materials and supplies for use in any future erosion events	Council, NPWS	Following an emergency event.
4.16	Review: Undertake an After Action Review (see section 7.5) review of this CZEAS and update as necessary to improve the future effectiveness of coastal emergency response actions.	Council, NPWS, NSW SES, DCCEEW	Within 2 weeks of plan activation, or as necessary.



7.3 Emergency Coastal Protection Works

Emergency coastal protection works (ECPW) are defined in the State Environmental Planning Policy (Resilience and Hazards) 2021 as:

“works comprising the placement of sand, or the placing of sandbags for a period of not more than 90 days, on a beach, or a sand dune adjacent to a beach, to mitigate the effects of coastal hazards on land”

Locations where ECPW may be carried out, the nature of the works, and accosted triggers are summarised in Appendix A. The nominated ECPW would generally be comprised of Nature Assisted Beach Enhancement (NABE) (also known as beach scraping) - undertaken as a form of beach nourishment - could also be undertaken during the response phase if time, resource and event magnitude permit. Determination of local specifications for the scraping works would be dependent upon the beach state at the time, and would therefore involve consultation with relevant NSW government agencies as per the communication protocol. Appendix B provides an overview of NABE processes.

Importantly, during the emergency response phase, the window for physical works is extremely limited. Realistically, only the measures listed above are likely to be feasible. Any larger or more complex measures would need to be assessed case-by-case and are unlikely to proceed within the short timeframes associated with active emergency conditions.

The determination of which ECPW measure is most appropriate should be made in conjunction with technical coastal engineering advice, including engagement with DCCEEW (see Response Action 3.12 to 3.13). All emergency works must be undertaken in consultation with a suitably qualified coastal or geotechnical engineer to ensure structural integrity, safety, and compliance with environmental and planning requirements

Appendix A of this document provides a series of Local Area Sub-Plan for local beaches considered to be exposed to high levels of infrastructure or public safety risk due to coastal hazards. These plans provide local beach-level specificity to CZEAS actions, along with associated companion mapping.

7.4 Recording Coastal Emergency Impacts and Emergency Response Actions

After a coastal emergency event, Council is to issue a formal After Action Review in coordination with LEMC partners, in order to record the following details in a database, and to maintain effective emergency actions and understand any changes in coastal conditions over time (DPIE, 2019):

- Details of the emergency event – including any coastal erosion, coastal inundation (and wave run-up), and coastal cliff and slope instability. Details are to include the weather conditions and tide under which they were caused including photographs where possible.
- The location of any assets and infrastructure that were damaged and details of the extent of the damage.
- Details of any emergency coastal protection works undertaken (including NABE), including the cost and the installation date.
- Details of any planned future coastal protection works in the CMP that are not yet undertaken, including the cost and the expected implementation timeframe.
- Details of any survey of the beach levels and other features that may be considered required to provide a greater understanding of the hazard or the event.
- Where possible, community feedback regarding the emergency communication and response efforts.
- Review and update (if required) this CZEAS, in particular the Emergency Action Plan, in consultation with the NSW SES and any other relevant agencies (see Section 5 above).



8 APPROVALS PATHWAYS

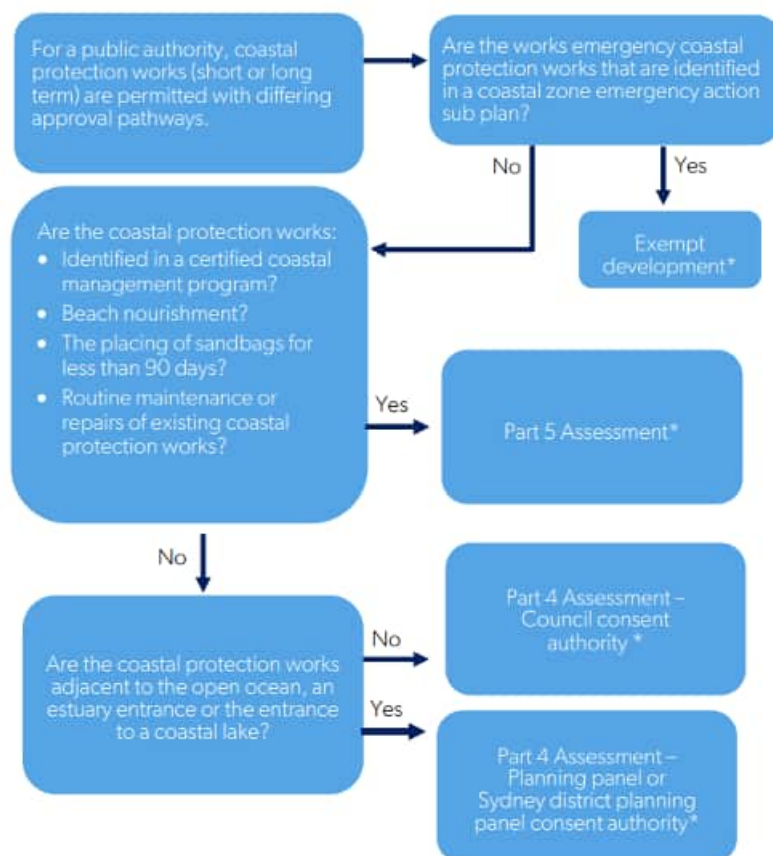
Information on approval pathways for coastal protection works and emergency coastal protection works are set out in the Coastal protection works fact sheet (NSW DPE, 2018). A public authority may carry out coastal protection works without development consent if the works are:

- Identified in the relevant certified CMP.
- Beach nourishment.
- Placing sand bags for not more than 90 days.
- Routine maintenance works or repairs to existing coastal protection works.
- Explicitly identified in a certified CZEAS

The NSW coastal management framework requires all proposals for coastal protection works to be considered strategically through the development of a CMP. Public authorities can carry out emergency coastal protection works, as exempt development, where these works are in accordance with a CZEAS (such as this document) prepared by the relevant council and included in a certified CMP – see Figure 8-1.

Where works do not meet these criteria, assessment and approval by the relevant Regional or Local Planning Panel would be required before implementation.

Coastal protection works: assessment pathway for public authorities (including councils)



*Other approvals may be required under different legislation.

Figure 8-1 Coastal protection works: assessment pathway for public authorities (including councils). Source: DPE (2018).



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APPENDIX A BEACHES – LOCAL AREA PLANS







LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Recovery Action 4.4
Collapse escarpment at
accessway(s) to reinstate
safe access



LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Recovery Action 4.8
Restore safe beach
access

Respond Action 3.9
Close foreshore access

Recovery Action 4.4
Collapse escarpment at
accessway(s) to reinstate
safe access

Respond Action 3.8
Close road and car
park access as
required



LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Respond Action 3.8
Close road as required

Respond Action 3.9
Close foreshore access

Recovery Action 4.4
Collapse escarpment at accessway(s) to reinstate safe access



LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Respond Action 3.9
Close foreshore access

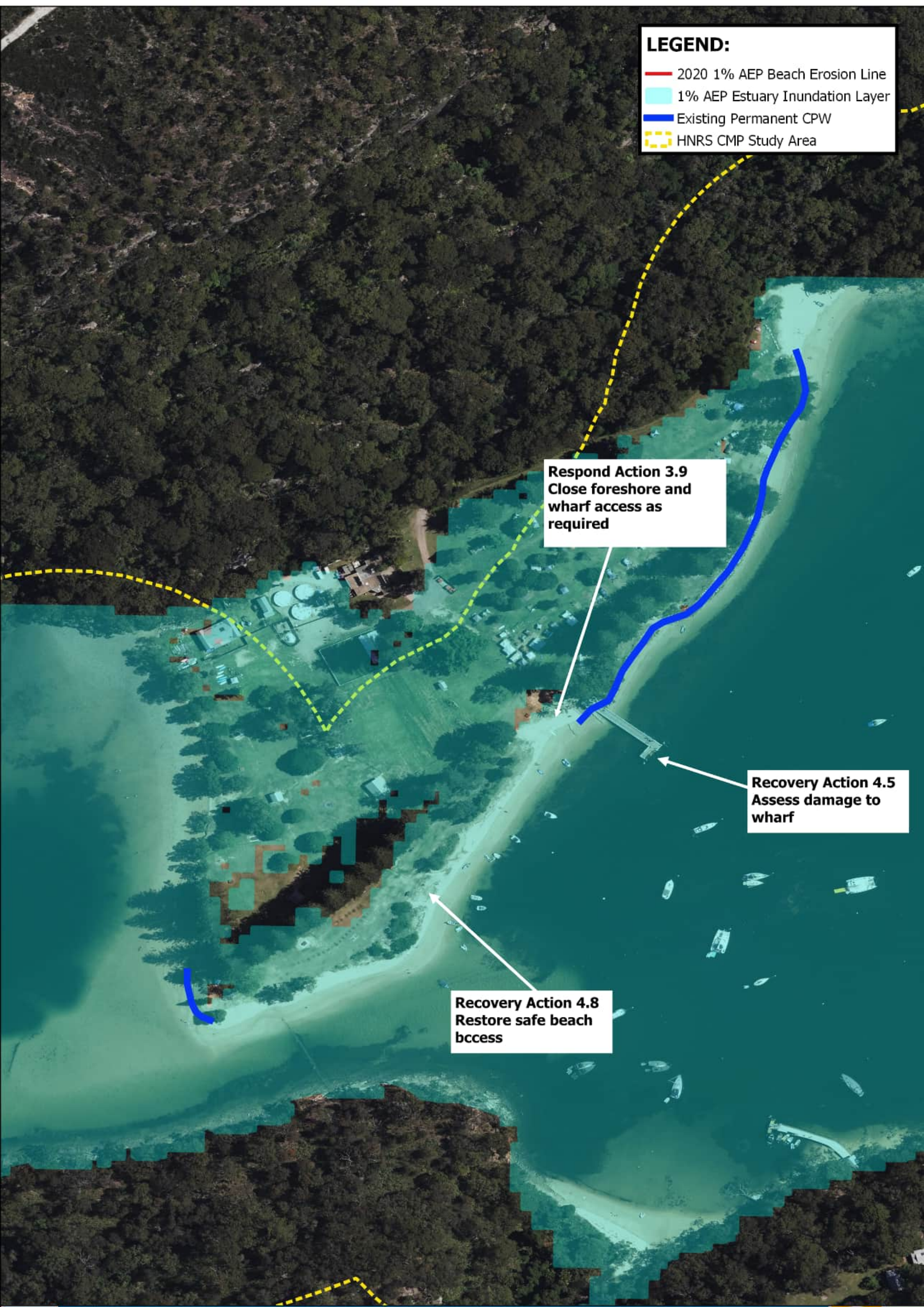
Respond Action 3.9
Close foreshore access

Recovery Action 4.4
Collapse escarpment at
accessway(s) to reinstate
safe access

Recovery Action 4.5
Assess damage to
infrastructure - including
boat ramp, wharves, and
stormwater outlets

Recovery Action 4.8
Restore safe beach
bccess

Recovery Action 4.5
Assess damage to
infrastructure - including
boat ramp, wharves, and
stormwater outlets



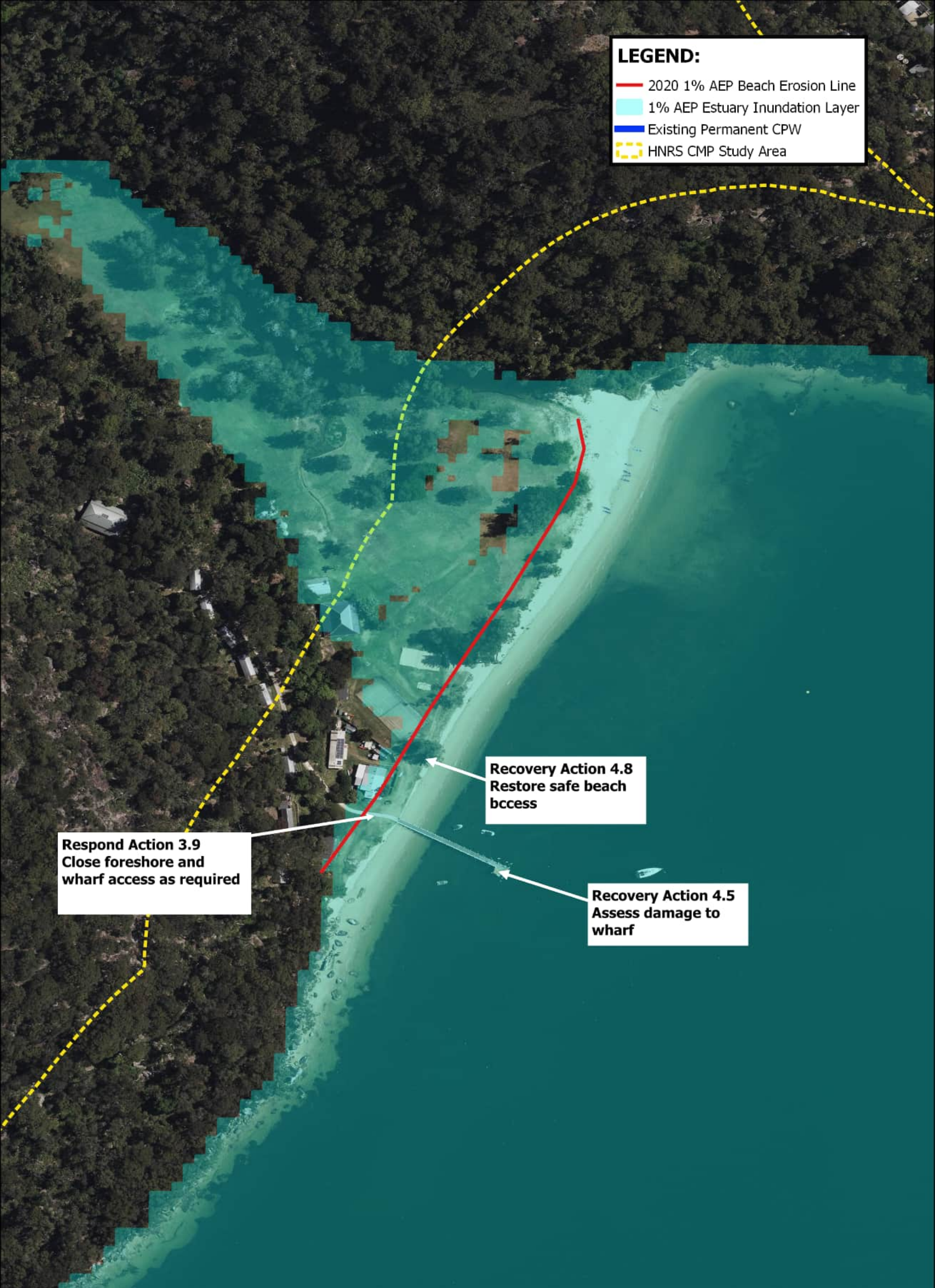
LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Respond Action 3.9
Close foreshore and
wharf access as
required

Recovery Action 4.5
Assess damage to
wharf

Recovery Action 4.8
Restore safe beach
access



LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- HNRS CMP Study Area

Respond Action 3.9
Close foreshore and
wharf access as required

Recovery Action 4.8
Restore safe beach
bccess

Recovery Action 4.5
Assess damage to
wharf



Respond Action 3.9
Close foreshore and
wharf access as required

Recovery Action 4.8
Restore safe beach
access

Recovery Action 4.5
Assess damage to
wharf

LEGEND:

- 2020 1% AEP Beach Erosion Line
- 1% AEP Estuary Inundation Layer
- Existing Permanent CPW
- - - HNRS CMP Study Area



APPENDIX B OVERVIEW OF NABE





B-1 Overview of Nature Assisted Beach Enhancement

Nature Assisted Beach Enhancement (NABE) – otherwise referred to as beach scraping, is a technique used for accelerating beach recovery following erosion by changing the slope of a beach, periodically, to allow the energy of the sea to bring additional sand onshore. This is achieved by transferring a small amount of sand from the beach berm at low tide and adding the sand to the dune system. This process serves to assist nature in beach enhancement by systematically accelerating up the natural cross-shore recovery process of the beach profile (Carley, et al., 2010). NABE can therefore be used as a measure to aid recovery where beach access has been damaged following a storm and can be combined with the restoration works for the key beach access tracks throughout the LGA.

NABE is basically a mechanical intervention to speed up the natural processes of beach and foredune recovery after a storm event. It is a useful tool to achieve rapid re-establishment of a foredune and beach berm. It can not only be used to create a buffer against further back beach erosion during following storms but can also re-establish a dune crest level that will prevent a wash through from wave overtopping. While it is not a panacea for overcoming long-term coastal recession, it can reduce the rate of recession by mitigating the compounding impacts of multiple storm erosion events (Gordon, 2015).

It is recognised that the restoration works proposed would not, per se, form a permanent solution to an erosion problem and scraping may need to be done again at some future time. However, such soft engineering techniques are encouraged as they do not interfere significantly with the natural processes and they have minimal adverse impacts on the environment (Gordon, 2015). Beach scraping has higher uncertainty as a protection measure than other coastal management options, so should only be undertaken in conjunction with a comprehensive monitoring program (Carley, et al., 2010).

B-2 Methods

Some general information and considerations are provided herein for the application of NABE across the Pittwater foreshores.

- As part of NABE activities material is bulldozed from the swash zone, starting at low tide, and pushed up onto the berm working up the swash zone as the tide rises – see Figure B-1. The sand harvested from the swash zone onto the berm can then be moved to the back of the beach during the higher phases of the tide to form the incipient dune (Gordon, 2015).
- It should be noted that working on a beach, and particularly in the swash zone, is a harsh environment for any mechanical equipment and it is often impractical to use anything other than track tread vehicles such as bulldozers and track tread front-end loaders for swash zone work.
- From a practical viewpoint it is often prudent to ensure projects are undertaken using at least two machines. Not only does this speed up production, but it also ensures that there is back up for retrieval if one of the machines becomes bogged. The risk of equipment bog down is significant in the swash zone.
- Carley et al (2010) provide data on the realistic yield of bulldozers indicating that a D6 can move 94 m³/hr, a D7, 175 m³/hr and a D9 around 188 m³/hr.
- In relatively calm wave conditions following storm erosion, it has historically been found that the rate of natural resupply from the offshore region to the swash zone is initially rapid so that typically, a 0.3 m skimming of the swash zone on one tide can result in near reinstatement of the previous swash zone by the next tide (Gordon, 2015).
- Experience dictates that there is no need to fully re-build eroded dunes using NABE. Rather, NABE should be used to commence “kick-start” the natural process and provide early opportunities for re-planting and re-colonisation by remnant vegetation so that the natural sand trapping can take over the dune building process (Gordon, 2015).

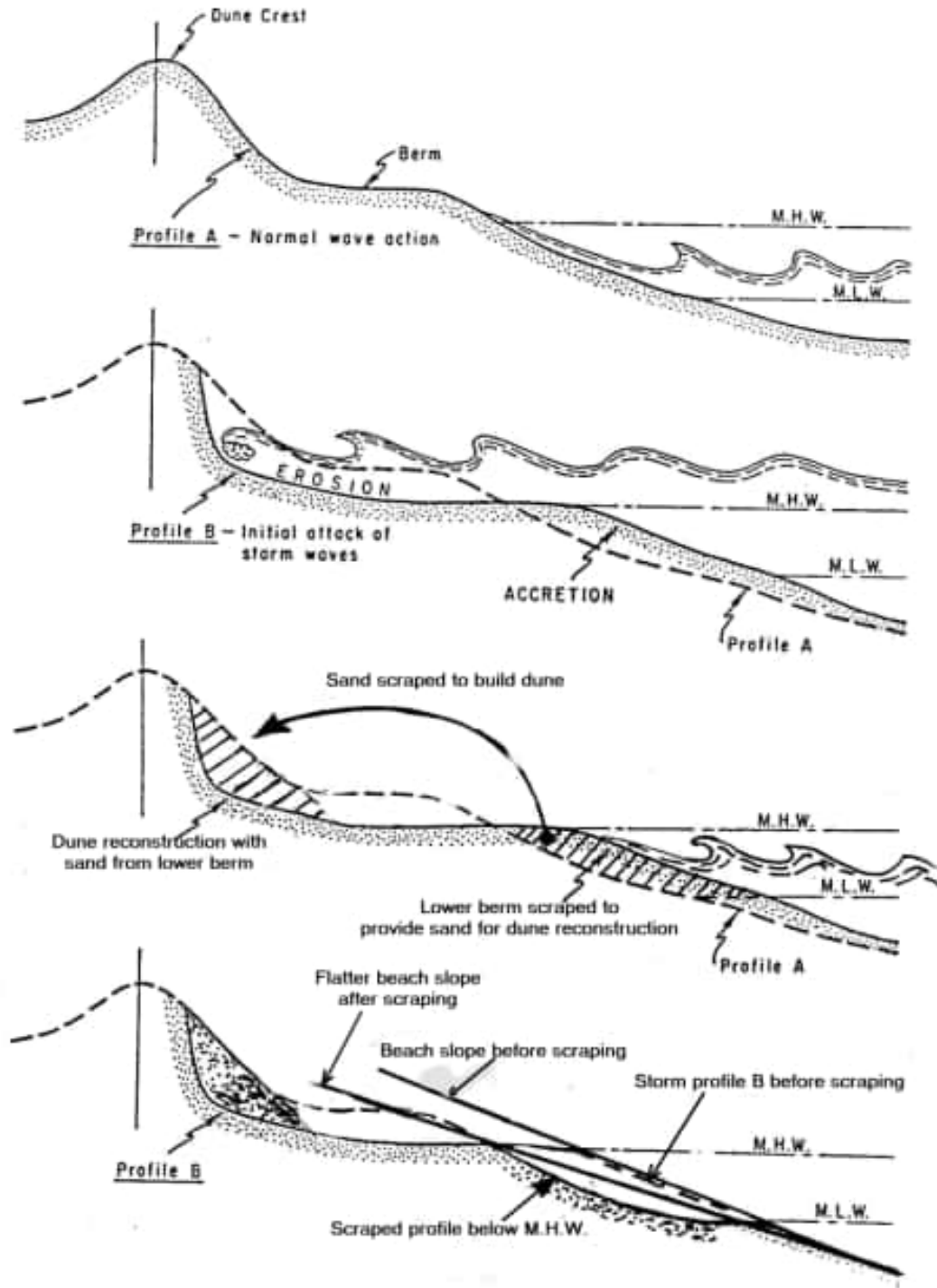


Figure B-1 Schematic diagram illustrating the application of beach scraping (Carley, et al., 2010)

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